Puget Sound Council members and PSAT staff tour the state's most productive clam-growing area, Oakland Bay (near Shelton). *Scott Redman*

CONCLUSION

Implications for Ecosystem Management

A first step in crafting resource policies for dealing with climate change is to ensure that policies perform well in the face of historic climate variability.

> *"We must recognize that the past may not be a dependable guide to the future."*

An important set of questions to pose is: how well has this resource policy fared in the face of past climate variations? What types of climate variations present the greatest risk to the resource of interest? Which management or policy options would reduce those risks? The answers to these questions can guide development of policies that are resilient and adaptable to a wide range of climate conditions.

This step is necessary but not sufficient for preparing for climate change. It is also important to recognize that the past may not be a dependable guide to the future. Planners should examine how resource management policies would perform in the future as key aspects of climate (e.g., maximum summer temperatures, sea level) change.

For example, stormwater planning, which relies on historical data, may underestimate the chance of intense precipitation events in a warmer climate, resulting in more frequent than anticipated combined sewer overflow events and pollution of Puget Sound waters. Similarly, habitat conservation plans concerning coastal wetlands need to include projected sea level rise and perhaps allow for inland expansion through rolling easements as has been done elsewhere.

A related challenge is to maintain or increase the resilience of the Puget Sound ecosystem. The fact that it is impossible to project exactly what climate change means for a certain species of fish or crab means that it will be very difficult, if not impossible, to engineer resource management to match anticipated climate conditions. It may be more effective to maintain the ecosystem's capacity to adapt to future changes as they come.

This could mean, for example, preserving wild salmon population diversity through the conservation and restoration of interconnected freshwater and estuarine habitat and the proper management of hatchery programs. This also could mean preserving the ability of wetlands to migrate inland to ensure adequate nearshore habitat for juvenile salmon and other creatures.

Vigilantly monitor change

Effective management and planning requires we put systems in place to monitor regional climate and ecosystems for ongoing changes. The effects of climate change may initially be subtle and difficult to disentangle from the changes wrought by humans and by natural climate variations, but without monitoring and accounting for these changes we will fail to understand the root causes of changes in the Sound or the ways in which current conditions differ from those experienced in the past.

Analysis of the causes of hypoxia in Hood Canal, for example, needs to include observed trends in temperature and runoff—an approach that is being taken by the Hood Canal Dissolved Oxygen Program.[80] Future management decisions will be best served by an informed understanding of how global climate change is manifesting in changes in Puget Sound climate, hydrologic conditions and ecosystems.

Expect surprises

It is essential to expect surprises and design for flexibility to changing conditions. We should design contingency planning into management guidelines to ensure that ongoing adaptation to unexpected (or uncertain) conditions can occur without requiring additional policy intervention.

Preparing for climate change can be thought of as an exercise in risk management. Projected regional climate change shows a risk of substantial changes to the physical and biological environment of Puget Sound and prudent resource management will prepare for these risks. By assessing the outcomes associated with different resource management activities under various climate change scenarios, planners and decision makers can prioritize their adaptive strategies.

"It is essential to expect surprises and design for flexibility to changing conditions."

When relatively little is at stake, plans could be prepared under a conservative or best-case climate change scenario. When more is at stake, or when climate impacts are likely to have irreversible ecosystem consequences, planners should consider a mid-range or worst-case scenario.

Over the coming decades, global warming will bring new change to the environment of Puget Sound. By starting now to plan for these changes, we can build the political, socioeconomic and ecological capacity required to prepare for and cope with climate impacts in the Puget Sound region.